Logarithmic scale of lengths and model of natural events

D.L.Kirko

Abstract

Many physical quantities have numerical values in a very large range, so the logarithmic scale is often used to denote them. The paper considers the possibility of representation of natural lengths and fundamental physical constants in a logarithmic (power) form and discusses the advantages of such representation. A considerable fact is the degree expression of many formulas and dependencies in Lobachevski geometry. We propose the construction of a power function $\lambda(x)$ linking Lobachevski geometry and observable natural lengths. Euclidean geometry is fully incorporated into Lobachevski geometry. Astrophysicist Nikolai Kozyrev proposed the existence of a time flow or a space flow, representing the flow of time. The interpretation of the space flow (time flow) introduced by Kozyrev as the motion of point events in the space of events, which can be associated with the observable Universe, is considered.

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Contest

Introduction

A number of modern works discuss new physical principles. These are new views on models of time, on representation of interactions and manifestation of their properties, on structure and properties of ether as a new substance and on theories of a single field. In accordance with these theoretical models experimental studies are carried out, aiming at registration of a new substance and substantiation of new physical principles. At the same time some researchers consider mathematical regularities appearing between physical quantities in different fields of physics and natural sciences [1]. This discussion is largely related to the possibility of representing physical quantities and physical constants in logarithmic and power form. This trend is apparently due to the manifestation of a very large range of physical quantities, for example: the range of lengths known in physics lies in the interval from the Planck length $l_P \approx 1.6\ 10^{-33}$ cm to the size of the observable Universe $1_U \sim 10^{28}$ cm, the range of temperature registration lies in the range from liquid helium temperature $T \approx$ 4.3 K to thermonuclear temperatures $T \sim 10^8$ K, etc. In view of this, many physical quantities are depicted on a logarithmic scale, i.e. represented as logarithms of magnitudes on the basis of 10, 2, e... etc. In this paper the author would like to consider in detail manifestation of logarithmic (power) regularities in lengths, times, masses, energies and the most important fundamental physical constants.

Consideration of new principles of physical interactions and time requires involvement of geometrical description. Therefore, many scientists propose the use of non-Euclidean geometries for this purpose. This approach probably requires the involvement of both known interpretations of non-Euclidean geometries and justification of new ones. In view of this, the author proposes to consider the representation of observable lengths in Lobachevski geometry. The familiar Euclidean geometry is entirely included in the Lobachevski geometry, which is a broader, general geometry and contains a vast number of new properties. In the author's opinion, there is a possibility to describe physical bodies with the help of Lobachevski geometry. At the same time, the representation of many formulas of geometry in a power form deserves attention. As a possible application of Lobachevski geometry in this

paper we consider the description of radii of planets and satellites of planets of the Solar system with the help of discrete values of the function following from Lobachevski geometry.

Astrophysicist Nikolai Kozyrev proposed the hypothesis of the existence of a time flow or cosmic flow permeating the Universe. Apparently, Kozyrev, like many astronomers, struck by the size and consistency in the existence of different parts of the Universe, was looking for a physical, real factor linking together the entire Universe. Therefore, he suggested the possibility of transmission over any distance of interaction and information through the cosmic flow with infinite speed, and also allowed the flow to influence the manifestation in nature of asymmetry (the difference between right and left) and the presence of nonequilibrium processes. Kozyrev's ideas are closely related to the hypothesis of the existence of long-range action, which originated in Newton, and to the idea of a single field, which implies the existence of a single universal interaction. Kozyrev carried out astrophysical and laboratory experiments testifying to the existence of space flow. Further experiments by other scientists are not only connected with the reproduction of the unique devices and methods applied by Kozyrev, and the ways of conducting the experiments. The impulse of scientific thought, set by Kozyrev, found gradual expression in the studies of scientists, either agreeing with Kozyrev's approach, or offering their own positions in solving the problem.

According to the author, a visible interpretation of Kozyrev's time flow can be offered with the help of the model of natural events, considered in this paper. The flow of time in the work is represented as a flow of events flowing from the future to the past through the present, which serves as a semblance of a partition of the two domains. In this case, all physical bodies are interpreted as events in the space of event - the most complete set of all events, and the interaction and exchange of information occurs between events regardless of the distance between them in the space of events.

1. Logarithmic representation of lengths

Many physical quantities: lengths, times, masses, energies, temperature etc. have a large numerical range. For example, the currently known lengths occupy the region from the Planck length $l_P \approx 1.6 \cdot 10^{-33}$ cm to the size of the observable Universe $l_U \sim 10^{28}$ cm. Therefore, a logarithmic scale is often used to represent the values of physical quantities on the numerical

axis. In this chapter the logarithmic scales of lengths, times, masses, energies will be presented and the resulting numerical regularities will be described. Special attention will be paid to consideration of logarithmic (power) properties in relations between fundamental physical constants.

1.1. Observable length. Standards of length. Matrix L_n

A length of a body is the one from the most important physical characteristics. The expression of length one can be shown in the certain standards or the units of length. In other words, a length finding consists in comparison of the length of this body with the length of the body, defined as standard of length. Suppose that Euclidean geometry is true for the description of physical bodies. Consider bodies, don't think about their internal structure, organization and properties. Think that length l_n is the biggest length of n^{th} body and it can be presented in the view of a segment of a straight line. Then observable (measured) length of a physical body will be the following value:

$$l_k^n = \frac{l_n}{l_k} \tag{1}$$

Where l_n - length of a measurable body (real number $0<l_n<+\infty$), l_k - length of a body defined as the standard of length (real number $0<l_k<+\infty$). In physics this form isn't used (attention isn't accented at this fact), and the expression is applied:

$$l_k^n = l \quad \text{(units of length)} \tag{2}$$

Where l (number) is the expression of length of a body in the certain standards of length: cm, m, km etc.

Note that the lengths l_n and l_k in expression (1) can be multiplied at real number a ($0< a < +\infty$), but the ratio of lengths can't change:

$$\frac{al_n}{al_k} = \frac{l_n}{l_k} = l_k^n \tag{3}$$

Consider the totality of n of physical bodies.

$$0 < l_1 < l_2 < ... < l_k < ... < l_n \tag{4}$$

Suppose that it is possible to carry out the comparisons (the measurements) of lengths of bodies with each other. Select as the standard of length l_1. Then the observable (measured) lengths can be:

$$l_1/l_1 \;\; l_2/l_1 \;\; l_3/l_1 \;\; \ldots \;\; l_k/l_1 \;\; \ldots \;\; l_n/l_1 \tag{5}$$

Analogically one can express the lengths in any standard of length l_k:

$$l_1/l_k \;\; l_2/l_k \;\; l_3/\mathrm{l_k} \;\; ... \;\; l_k/\mathrm{l_k} \;\; \ldots \;\; l_n/l_k \tag{6}$$

In other words, such transition from one standard to another will mean, that a length can be expressed in other units, for example, neither cm, but in m.

In the result all the lengths l_1 l_2 ... l_n can be equivalent and anyone from these lengths can be defined as the standard of length.

All the totality of the observable lengths of n^{th} bodies can be placed in the square matrix by the sizes ($n\times n$):

$$L_n=\begin{pmatrix} l_1/l_1 & l_2/l_1 & \ldots & l_n/l_1 \\ l_1/l_2 & l_2/l_2 & \ldots & l_n/l_2 \\ \ldots & \ldots & \ldots & \ldots \\ l_1/l_n & l_2/l_n & \ldots & l_n/l_n \end{pmatrix} \tag{7}$$

On the main diagonal of the matrix L_n units are located. The different lines of the matrix can express lengths of bodies in different units of a length. The elements l_k^n and l_n^k can be reverse values:

$$l_k^n = \frac{l_n}{l_k} = \frac{1}{\frac{l_k}{l_n}} = \frac{1}{l_n^k} \tag{8}$$

1.2. Characteristic lengths. Logarithmic spatial scale

Consider a principle of the disposition of lengths on a spatial scale. For this purpose we select natural multitudes of atoms, nuclei, planets, stars, people and others. In each multitude we can consider the most important length or the characteristic length.

The sizes of atoms are located in the range (1-5)·10^{-8} cm, therefore as a characteristic size of atomic systems we will take the radius of hydrogen atom –the Bohr's radius: a_B =5.292·10^{-8} cm. Dimensions of nuclei are in the range (2-10)·10^{-13} cm, as the characteristic dimension of nucleus we define the length: r_k=10^{-13} cm.

The radiuses of a planet orbit of the Solar system place the range from ≈0.4 a.u. (astronomical units) (the Mercury) to ≈39.4 a.u. (the Pluto) (1 a.u.=1.49·10^{13} cm). Expediently to select as a characteristic dimension the average radius of the Earth orbit: $R_\oplus$ =1.49·10^{13} cm. According to the modern presentations, the Sun is a stationary star placed in the average part of the main sequence of the Herzsprung-Ressel diagram. At the same time, in galaxies the dominance of stars exists, belonging to the main sequence. So as a characteristic dimension we will select a radius of the Sun: $r_\odot$ = 6.96 ·10^{10} cm.

Consider also the other natural multitudes: the multitudes of elementary particles: leptons, baryons; the multitudes of organic molecules, alive cells; the multitudes of cities; the multitudes of astronomical objects: asteroids, star clusters, galaxies, and metagalaxes. By the analogy with earlier presented multitudes we will define the characteristic dimension in the each multitude.

Dispose the characteristic lengths of physical bodies in tab.1. In the right column we place the natural logarithms of lengths.

Some logarithms are close to whole or half-integer numbers:

$\ln l_k$ = -29.93	$\ln l_P$ = -75.51
$\ln ƛ_e$ = -23.98	$\ln ƛ_p$ = -31.49
$\ln a_B$ = -19.06	$\ln l_U$ = 64.47
$\ln l_m$ = 5.14	
$\ln r_\oplus$ = 20.27	
$\ln r_\odot$ = 24.97	
$\ln R_\oplus$ = 30.33	

***Table 1*. Characteristic lengths of physical bodies**

	l	cm	ln l
Plank's length	l_P	$1.616 \cdot 10^{-33}$	-75.51
leptons ∗)	l_l	10^{-16}	-36.84
Compton's length of proton	$\lambdabar_p$	$2.103 \cdot 10^{-14}$	-31.49
nucleus ∗)	l_n	10^{-13}	-29.93
Compton's length of electron	$\lambdabar_e$	$3.862 \cdot 10^{-11}$	-23.98
Bohr's radius	a_B	$5.292 \cdot 10^{-9}$	-19.06
Compton's length of neutrino	$\lambdabar_\nu$	$1.1 \cdot 10^{-6}$	-13.72
organic molecule ∗)	l_m	10^{-5}	-11.51
living cell ∗)	l_l	10^{-3}	-6.91
man	l_m	$1.7 \cdot 10^{2}$	5.14
city ∗)	l_c	10^{6}	13.82
radius of the asteroid (Pallada)	r_a	$2.915 \cdot 10^{7}$	17.19
radius of the Earth (equator)	$r_\oplus$	$6.378 \cdot 10^{8}$	20.27
radius of the Moon orbit	$R_($	$3.844 \cdot 10^{10}$	24.37
radius of the Sun	$r_\odot$	$6.96 \cdot 10^{10}$	24.97
radius of the Earth orbit	$R_\oplus$	$1.49 \cdot 10^{13}$	30.33
dimension of the Solar system ∗)	R_S	10^{15}	34.54
distance from the Sun to the nearest star (Procsima Centaurs)	l_s	$4.012 \cdot 10^{18}$	42.84
dimensions of a star cluster ∗)	l_{sc}	10^{20}	46.05
Galaxy ∗)	l_G	10^{23}	52.96
Metagalaxy ∗)	l_M	10^{25}	57.56
The observed Universe ∗)	l_U	10^{28}	64.47

*) the order of value is indicated

Separate the values of the logarithms of characteristic lengths in tab.1 are close to the view:

$$\ln\ l = 5k \tag{9}$$

k – integer number

Note that a usual spatial scale of these objects is essentially nonlinear. A logarithmic spatial scale is more uniform. The operations of multiplication and division of lengths on a logarithmic scale are reduced accordingly to the operations of addition and subtraction.

1.3. Main characteristic lengths. Matrixes $L(\alpha,N)$ and $A(\alpha,N)$

A totality of spatial values exists in nature. Define the connection between characteristic lengths of different natural multitudes (tab. 1). We present values l_n and l_k from expression (1) as:

$$l_n = e^{\alpha n} \qquad l_k = e^{\alpha k} \tag{10}$$

α - real number ($0 < \alpha < +\infty$),

n, k – integer numbers

Then characteristic length of a physical body will be written in the view:

$$l_k^n = \frac{l_n}{l_k} = e^{\alpha(n-k)} \tag{11}$$

Taking into account nearness of natural logarithms of the some characteristic lengths (tab.1) to view (9), we choose as the main characteristic lengths the values:

$$l_k^n = e^{5(n-k)} \tag{12}$$

The main lengths can contain the values:

$$e^{-5N} \dots e^{-10}\ e^{-5}\ e^{0}\ e^{5}\ e^{10} \dots e^{5N} \tag{13}$$

N - natural number

At the choice as unit of length 1 cm and N=15 the main lengths can be written in the form:

$$e^{-75} \dots e^{-10}\ e^{-5}\ e^{0}\ e^{5}\ e^{10} \dots e^{75} \ \text{(cm)} \tag{14}$$

If we take as the unit of length $l_0 = \mathrm{e}^{-75}$ (cm) near to the Plank's length, then the main lengths can be presented in the view:

$$e^{0}\ \mathrm{e}^{5} \dots e^{75} \dots e^{150} \ \text{(units } l_0\text{)} \tag{15}$$

Analogically we can choose as the unit of length any the main length $e^{5(n-k)}$. At the choice $(n\text{-}k)_{\max} = 15$ all the totality of the characteristic lengths can be presented in the view of the

square matrix $L(\alpha,N)$ with dimensions (31×31). In this case at α=5 and N= 15 the matrix are presented by the view:

$$L(5,15)=\begin{pmatrix} e^{0} & e^{5} & \ldots & e^{75} & \ldots & . & e^{150} \\ e^{-5} & e^{0} & . & . & . & . & . \\ \ldots & . & \ldots & . & . & . & . \\ e^{-75} & \ldots & . & e^{0} & \ldots & . & e^{75} \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ e^{-150} & \ldots & . & e^{-75} & \ldots & . & e^{0} \end{pmatrix} \tag{16}$$

On the main diagonal of the matrix the units are located. The symmetrical elements relatively of the main diagonal are the reverse values. Notice that matrix (16) is a particular case of matrix (7) at the choice of measurable lengths in the view (12).

Consider natural logarithms of the main characteristic lengths:

$$a_k^n = \ln l_k^n = 5(n-k) \tag{17}$$

This values can be disposed by the analogy with matrix $L(\alpha,N)$ in square matrix $A(\alpha,N)$. For α=5, N=15 the matrix can be written in the view:

$$A(5,15)=\begin{pmatrix} 0 & 5 & \ldots & 75 & \ldots & . & 150 \\ -5 & 0 & \ldots & . & . & . & . \\ . & . & . & . & . & . & . \\ -75 & . & \ldots & 0 & \ldots & . & 75 \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ -150 & . & \ldots & -75 & \ldots & . & 0 \end{pmatrix} \tag{18}$$

On the main diagonal of the matrix the zeroes are placed. The symmetrical element relatively of the main diagonal is expressed as follows:

$$a_k^n = -a_n^k \tag{19}$$

So matrix $A(\alpha,N)$ is sidelong-symmetric (asymmetric).

The common view of square matrixes $L(\alpha,N)$ and $A(\alpha,N)$ can be the following:

$$L(\alpha,N)=\begin{pmatrix} e^{0} & e^{\alpha} & \dots & e^{\alpha N} & \dots & . & e^{2\alpha N} \\ e^{-\alpha} & e^{0} & . & . & . & . & . \\ . & . & . & . & . & . & . \\ e^{-\alpha N} & . & \dots & e^{0} & \dots & . & e^{\alpha N} \,.. \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ e^{-2\alpha N} & . & \dots & e^{-\alpha N} & \dots & . & e^{0} \end{pmatrix} \qquad (20)$$

$$A(\alpha,N)= \alpha\begin{pmatrix} 0 & 1 & \dots & N & \dots & . & 2N \\ -1 & 0 & . & . & . & . & . \\ . & . & . & . & . & . & . \\ -N & . & \dots & 0 & \dots & . & N \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ -2N & . & \dots & -N & \dots & . & 0 \end{pmatrix} \qquad (21)$$

α- real number ($0<\alpha<+\infty$), N-natural number ($N<+\infty$)

The number α in matrixes expresses actually a scale on a logarithmic axis for the system of the basis lengths: $e^{-\alpha N}$ ... e^{0} ... $e^{\alpha N}$. Consider the appearance of logarithmic conformities of natural laws for other values.

1.4. Logarithmic scales of times, masses and energies

We dispose in tab. 2 the characteristic times of elements of natural multitudes. The times of light transference of the characteristic lengths of natural multitudes ($t = l\,/c$) are contained in the first group of correlations. The second group of the correlations consists from the periods of orbital rotation and around it axis. And in the third group the times connected with lives of elements of natural multitudes are. In the right column the expressions shifted at the logarithm of the light velocity are placed. Therefore these values coincide with the characteristic lengths (tab.1, item 1.2). We show the values near to the view:

$$\ln t + \delta_1 = 5k \qquad (22)$$

k – integer number, $\delta_1 = \ln c = 24.12$

***Table 2*. Characteristic times**

Time	t	sec	ln t	ln $t + \delta_1$
Plank's time	$t_P=l_P/c$	$5.390 \cdot 10^{-44}$	-99.63	-75.51
leptons	l_l/c	$3.336 \cdot 10^{-27}$	-60.97	-36.85
nucleus	l_n/c	$3.336 \cdot 10^{-24}$	-54.06	-29.94
Compton's length of electron	$\lambda\!\!\!^{-}{}_e / c$	$1.288 \cdot 10^{-21}$	-48.10	-23.98
Bohr's radius	a_B/c	$1.765 \cdot 10^{-19}$	-43.18	-19.06
Compton's length of neutrino	$\lambda\!\!\!^{-}{}_\nu / c$	$3.669 \cdot 10^{-17}$	-37.84	-13.72
period of electron in hydrogen atom	$T_e = \frac{2\pi a_B}{\alpha c}$	$1.519 \cdot 10^{-16}$	-36.42	-12.30
	1 cm/ s	$3.336 \cdot 10^{-11}$	-24.12	0
parapositrony lifetime	t_p	$1.25 \cdot 10^{-10}$	-22.80	1.32
ortopositrony lifetime	t_o	$1.4 \cdot 10^{-7}$	-15.78	8.34
city	l_c/c	$3.336 \cdot 10^{-5}$	-10.31	13.81
radius of the Earth	$r_\oplus /c$	$2.127 \cdot 10^{-2}$	-3.85	20.27
radius of the Moon orbit	$R_(/c$	1.282	0.25	24.37
radius of the Sun	$r_\odot/c$	2.322	0.84	24.96
radius of the Earth orbit	$R_\oplus /c$	$4.97 \cdot 10^{2}$	6.21	30.33
neutron lifetime	t_{ne}	$8.96 \cdot 10^{2}$	6.80	30.92
period of the Earth rotation (daily)	T_1	$8.616 \cdot 10^{4}$	11.36	35.48
period of the Earth rotation around the Sun	T_2	$3.156 \cdot 10^{7}$	17.27	41.39
life of man	t_m	$2.209 \cdot 10^{9}$	21.52	45.64
Galaxy	l_G/c	$3.336 \cdot 10^{12}$	28.84	52.96
The observed Universe	l_U/c	$3.336 \cdot 10^{17}$	40.35	64.47

$\ln t_P + \delta_1 = -75.51$

$\ln t_n + \delta_1 = -29.94$

$\ln a_B /c + \delta_1 = -19.06$

$\ln r_\oplus /c + \delta_1 = 20.27$

$\ln R_(/c + \delta_1 = 24.37$

$\ln r_\odot /c + \delta_1 = 24.96$

$\ln R_\oplus /c + \delta_1 = 30.33$

$\ln t_{ne} + \delta_1 = 30.92$

$\ln T + \delta_1 = 35.48$

$\ln l_U/c + \delta_1 = 64.47$

The interesting fact is that near the zero ($\ln t_p + \delta_1$=1.32) the value, connected with the lifetime of the symmetrical unstable system – parapositrony, is placed. We represent in tab.3 the characteristic masses of natural bodies. In the right column the next values are located: $\ln m + \delta_2$ ($\delta_2 = -27.41 = \ln m_e/m_p + \ln c$). The number δ_2 is chosen by the special case, so that the value for electron will be more close to an integer number. All the scale is placed approximately from -100 to 100.

***Table 3*. Characteristic masses**

Mass	m	g	ln m	ln $m + \delta_2$ (δ_2= -27.41)
neutrino	m_ν	$3.2 \cdot 10^{-32}$	-72.52	-99.93
electron	m_e	$9.109 \cdot 10^{-28}$	-62.26	-89.67
proton	m_p	$1.673 \cdot 10^{-24}$	-54.75	-82.16
$W^{\pm}$ - bozon	m_W	$1.444 \cdot 10^{-22}$	-50.29	-77.70
Z^0 - bozon	m_Z	$1.622 \cdot 10^{-22}$	-50.17	-77.58
organic molecule ∗)	m_m	$\cdot 10^{-17}$	-39.14	-66.55
cell ∗)	m_c	$\cdot 10^{-7}$	-16.12	-43.53
Plank's mass	m_P	$2.177 \cdot 10^{-5}$	-10.73	-38.14
		1	0	-27.41
man	m_M	$7 \cdot 10^4$	11.16	-16.25
city ∗)	m_C	$\cdot 10^{14}$	32.24	4.83
the asteroid (Pallada)	m_a	$2.2 \cdot 10^{23}$	53.75	26.34
the Moon	$m_☾$	$7.35 \cdot 10^{25}$	59.56	32.15
the Earth	$m_\oplus$	$5.98 \cdot 10^{27}$	63.96	36.55
the Jupiter	m_J	$1.90 \cdot 10^{30}$	69.72	42.31
the Sun	$m_\odot$	$1.99 \cdot 10^{33}$	76.67	49.26
star-clucter ∗)	m_{sc}	10^{38}	87.50	60.09
Galaxy ∗)	m_G	10^{44}	101.31	73.90
Metagalaxy ∗)	m_{Gc}	10^{46}	105.92	78.51
The observed Universe ∗)	m_U	10^{56}	128.94	101.53

∗) the order of value is indicated

Consider the values closest to the form:

$$\ln m + \delta_2 = 5k \tag{23}$$

k – integer number, $\delta_2 = -27.41$

$\ln m_\nu + \delta_2 = -99.93$ $\qquad$ $\ln m_\odot + \delta_2 = 49.26$

$\ln m_e + \delta_2 = -89.67$ $\qquad$ $\ln m_{sc} + \delta_2 = 60.09$

$\ln m_G + \delta_2 = 4.83$ $\qquad$ $\ln m_U + \delta_2 = 101.53$

At the same time, the some differences are interesting:

$\ln m_e - \ln m_\nu = 10.26$

$\ln m_p - \ln m_e = 7.51$

$\ln m_P - \ln m_e = 51.53$

Consider the characteristic energies of natural bodies (tab. 4). In the table the energies of motionless of bodies mc^2 (the masses are taken from tab. 3) are presented.

Table 4. **Characteristic energies**

Energy	E	erg	ln E	ln $E + \delta_3$ (δ_3=-75.65)
hydrogen atom	$\alpha^2 m_e c^2/2$	$2.181 \cdot 10^{-11}$	-24.55	-100.20
neutrino	$m_\nu c^2$	$2.876 \cdot 10^{-11}$	-24.27	-99.92
electron	$m_e c^2$	$8.187 \cdot 10^{-7}$	-14.02	-89.67
nucleus	8 MeV	$1.282 \cdot 10^{-5}$	-11.26	-86.91
proton	$m_p c^2$	$1.504 \cdot 10^{-3}$	-6.50	-82.15
organic molecule	$m_{om}\, c^2$	$8.988 \cdot 10^{3}$	9.10	-66.55
living cell	$m_c\, c^2$	$8.988 \cdot 10^{13}$	32.13	-43.52
Plank's energy	$m_P\, c^2$	$1.957 \cdot 10^{16}$	37.51	-38.14
	$1\ g \cdot c^2$	$8.988 \cdot 10^{20}$	48.24	-27.41
a man	$m_m c^2$	$6.292 \cdot 10^{25}$	59.40	-16.25
the Moon (orbit)	$m_c v_c^2 / 2$	$3.293 \cdot 10^{35}$	81.78	6.13
the Earth (orbit)	$m_\oplus v_\oplus^2/2$	$2.631 \cdot 10^{40}$	93.07	17.42
the Jupiter (orbit)	$m_J v_J^2 / 2$	$1.607 \cdot 10^{42}$	97.18	21.53
the asteroid (Pallada)	$m_a\, c^2$	$1.977 \cdot 10^{44}$	102.00	26.35
the Moon	$m_(c^2$	$6.606 \cdot 10^{46}$	107.81	32.16
the Earth	$m_\oplus\, c^2$	$5.375 \cdot 10^{48}$	112.21	36.56
the Jupiter	$m_J\, c^2$	$1.708 \cdot 10^{51}$	117.97	42.32
the Sun	$m_\odot\, c^2$	$1.789 \cdot 10^{54}$	124.92	49.27
star cluster	$m_{sc}\, c^2$	$8.988 \cdot 10^{58}$	135.75	60.10
Galaxy	$m_G\, c^2$	$8.988 \cdot 10^{64}$	149.56	73.91
Metagalaxy	$m_M\, c^2$	$8.988 \cdot 10^{66}$	154.17	78.52
The observed Universe	$m_U\, c^2$	$8.988 \cdot 10^{76}$	177.19	101.54

$$\delta_3 = -2\delta_1 + \delta_2 = -75.65$$

$$\delta_1 = \ln c\,, \qquad \delta_2 = \ln m_e/m_p + \delta_1$$

The values of logarithms of energies will differ from logarithms of masses on the magnitude: $\ln c^2 = 48.24 = 2\delta_1$. In the table also the values for nucleus energies and rotation energies are.

In the right column the values are placed:

$$\ln E + \delta_3 = \ln m + \delta_2 \qquad (24)$$

The number δ_3 is chosen, so that to obtain the value for electron -89.67. In the result all the scale places approximately from -100 up to 100, and the values $\ln mc^2 + \delta_3$ coincide with the values $\ln m + \delta_2$, located in tab. 3. Represent the differences of the values $\ln E + \delta_3$, which are close to 5, 10, 20:

$$\ln m_{\oplus} v_{\oplus}^2/2 - \ln m_{☾} v_{☾}^2/2 = 11.29$$

$$\ln m_J v_J^2/2 - \ln m_{\oplus} v_{\oplus}^2/2 = 4.11$$

$$\ln m_{\oplus} c^2 - \ln m_{\oplus} v_{\oplus}^2/2 = 19.14$$

$$\ln m_J c^2 - \ln m_J v_J^2/2 = 20.79$$

After the consideration of the logarithmic scales of times, masses and energies, one can do the following conclusions. The scale of times is shifted relatively the scale of lengths at the logarithm of the light velocity and has the analogical region (-75...0...75). If we except some values, then the scales of times and lengths in fact coincide. The scales of masses and energies are shifted from each other at the logarithm of the square light velocity. Their common range on the scale is (-100...0...100). The essential correspondence to the values: 5*k* (*k* –whole number) at the logarithmic scales of masses and energies isn't observed, though the separate values are close to these numbers.

1.5. Logarithmic presentation of correlations between fundamental physical constants

Consider the most important fundamental physical constants (tab. 5). Also we present the values obtained by the combination of the fundamental constants: the Compton's lengths of electron and proton ($\lambda\!\!\!^{-}_e, \lambda\!\!\!^{-}_p$), the Plank's length and mass (l_P, m_P) and others. At the same time, we also place correlations obtained from a reasoning of dimensions: l_F^e, l_F^p, l_s.

Present the correlations between fundamental physical constants reduced to the view $l/\lambda\!\!\!^{-}_e$ (tab. 6). In the right column natural logarithms of these values $\ln(l/\lambda\!\!\!^{-}_e)$ are located. These values are represented approximately in the view:

$$\ln \frac{l}{\lambda\!\!\!^{-}_e} \approx 5n + 0.5k \qquad (25)$$

n, *k* – integer numbers

In tab. 1 (item 1.2) the logarithms were considered: $\ln l_P$, $\ln \lambda\!\!\!^{-}_p$, $\ln \lambda\!\!\!^{-}_e$. The correlations $\ln(1_P/\lambda\!\!\!^{-}_e)$, $\ln(\lambda\!\!\!^{-}_p/\lambda\!\!\!^{-}_e)$, $\ln(a_B/\lambda\!\!\!^{-}_e)$ differ from these logarithms at the value: $-\ln \lambda\!\!\!^{-}_e = 23.98$.

It should be noted that if in tab. 1 (item 1.2) the some lengths aren't fundamental, as for example: $r_{\oplus} \approx e^{20}$ cm, $r_0 \approx e^{25}$ cm, $r_{\oplus} \approx e^{30}$ cm etc., then the correlations in tab. 6 are represented only by the fundamental correlations and can express the more physical generality.

Of course, each correlation includes indirectly a certain physical law and it needs more deep analysis of this coincidence (formula 25). It means that the value of the Bohr's radius a_B follows from the quantum properties of atom, the value of the Compton's length of electron λ_e follows from the effect of Compton, and length l_F^e characterizes the weak interactions. The Plank's length l_P even is at first sight only the combination of other constants, but is used together the Plank's mass m_P in the modern quantum theories of gravitation.

Table 5. **Fundamental physical constants**

		Value in CGS system	Dimensionality in CGS system
electron mass	m_e	$9.109 \cdot 10^{-28}$	g
proton mass	m_p	$1.673 \cdot 10^{-24}$	g
elementary charge	e	$4.803 \cdot 10^{-10}$	CGS units
Plank's constant	h	$6.626 \cdot 10^{-27}$	erg·s
	$\hbar = h / 2\pi$	$1.055 \cdot 10^{-27}$	erg·s
speed of light	c	$2.998 \cdot 10^{-10}$	cm/s
gravitational constant	γ	$6.673 \cdot 10^{-8}$	din·cm^2/g
Fermi's constant (weak interaction)	G_F	$1.436 \cdot 10^{-49}$	erg·cm^3
thin structure constant	$\alpha = e^2 / \hbar c$	$7.297 \cdot 10^{-3}$	
strong interaction constant	$\alpha_s = e_s^2 / \hbar c$	15	
Compton's length of electron	$\lambda_e = \hbar / m_e c$	$3.862 \cdot 10^{-11}$	cm
Compton's length of proton	$\lambda_p = \hbar / m_p c$	$2.103 \cdot 10^{-14}$	cm
Bohr's radius	$a_B = \hbar^2 / m_e e^2$	$5.292 \cdot 10^{-9}$	cm
classical electron radius	$r_c = e^2 / m_e c^2$	$2.818 \cdot 10^{-13}$	cm
	$l_F^e = G_F m_e / \hbar^2$	$1.175 \cdot 10^{-22}$	cm
	$l_F^p = G_F m_p^2 / \hbar^2 m_e$	$3.964 \cdot 10^{-16}$	cm
	$l_s = e_s^2 / m_p c^2$	$3.155 \cdot 10^{-13}$	cm
Plank's length	$l_P = \sqrt{\gamma \hbar / c^3}$	$1.616 \cdot 10^{-33}$	cm
Plank's mass	$m_P = \sqrt{\hbar c / \gamma}$	$2.177 \cdot 10^{-5}$	g

***Table 6*. Correlations between fundamental physical constants**

$l/\lambda\!\!\!^{-}_e$	Correlation	Numerical value	$\ln(l/\lambda\!\!\!^{-}_e)$
$a_B/\lambda\!\!\!^{-}_e =$	$(\hbar^2/m_e e^2)/(\hbar/m_e c) = \hbar c/e^2 = 1/\alpha$	137.0	4.92
$l_s/\lambda\!\!\!^{-}_e =$	$(e_s^2/m_p c^2)/(\hbar/m_e c) = (e_s^2/\hbar c)(m_e/m_p) = \alpha_s\beta$	$8.168\cdot10^{-3}$	-4.81
$r_c/\lambda\!\!\!^{-}_e =$	$(e^2/m_e c^2)/(\hbar/m_e c) = e^2/\hbar c = \alpha$	$7.297\cdot10^{-3}$	-4.92
$\lambda\!\!\!^{-}_p/\lambda\!\!\!^{-}_e =$	$(\hbar/m_p c)/(\hbar/m_e c) = m_e/m_p = \beta$	$5.445\cdot10^{-4}$	-7.52
$l_F^p/\lambda\!\!\!^{-}_e =$	$\{(G_F m_p^2)/(\hbar^2 m_e)\}/(\hbar/m_e c) = G_F/(\hbar^3/m_p^2 c)$	$1.026\cdot10^{-5}$	-11.49
$l_F^e/\lambda\!\!\!^{-}_e =$	$\{(G_F m_e)/\hbar^2\}/(\hbar/m_e c) = G_F/(\hbar^3/m_e^2 c)$	$3.042\cdot10^{-12}$	-26.52
$l_P/\lambda\!\!\!^{-}_e =$	$(\hbar/m_P c)/(\hbar/m_e c) = m_e/m_P$	$4.184\cdot10^{-23}$	-51.53

Present the next main properties and the essential advantages of these correlations between the fundamental physical constants:

1. The correlations are reduced to the view: $l/\lambda\!\!\!^{-}_e$ and all the values are represented on the logarithmic scale of lengths.

2. The correspondence of the logarithms of the correlations with the scale exist: $5n + 0.5k$ (n, k – integer numbers).

1.6. Summary

Consideration of possible lengths of physical bodies on a logarithmic scale isn't complete. In each set of bodies only a characteristic (typical) length was taken. A more complete and accurate representation of the distribution of lengths in each set of bodies would be. This task is more labor-intensive, so the author in this paper limited himself to considering only characteristic lengths.

It should be noted that the arrangement of characteristic lengths on the spatial scale isn't uniform, but becomes more uniform on the logarithmic scale. As the most natural on the scale, scale $\alpha = 5$. This doesn't at all mean that all characteristic lengths must strictly follow

an interval of 5 . The arrangement of lengths can contain a more complex structure of scales, as was shown by the example of the relations between the fundamental physical constants.

An advantage of the logarithmic scale is the transition from operations of multiplication and division between quantities represented on the scale to operations of addition and subtraction respectively, which can simplify calculations when dealing with quantities expressed in power form and differing by many orders of magnitude. Not only the base of natural logarithms *e*, but also numbers 10, 2, etc. can be used as a logarithmic (power) representation of physical quantities.

The author made the assumption that in nature there is no dedicated, chosen length of the body, and all dynes are equal. Consequently, any length can be used as a length reference.

2. Geometry of Lobachevski and logarithmic presentation of lengths

Nikolai Lobachevski based the construction of new geometry on a modified Euclid's axiom of parallel lines. The logical construction of geometry and various mathematical applications were developed by the scientist in a number of works [8,9].

The possibility of creating a new geometry served as a stimulus for the emergence of other non-Euclidean geometries. At the same time, various versions of Lobachevski geometry appeared, among which the most famous was the interpretation of Eugenio Beltrami, representing geometry on a pseudosphere with negative curvature. This interpretation of Lobachevski geometry was developed in a number of subsequent works.

It should be noted that such geometries as Lobachevski's, Riemann's, geometry on a cylindrical surface, can in a very small spatial domain coincide with Euclid's geometry. In his works, Lobachevski emphasizes that all positions, all formulas of his geometry go to the corresponding positions and formulas of Euclid at very small lengths. In other words, Euclid's geometry, which had already established itself as the geometry of the real world, is included entirely in Lobachevski's geometry. The scientist called his geometry "imaginary" and suggested the possibility of the existence of geometry on a cosmic scale. Many formulas for lengths, areas, and volumes in Lobachevski's geometry have a power (logarithmic) expression.

This chapter proposes a review of the main provisions of Lobachevski's geometry as they are presented in the original works. Then the possibility of introducing into Lobachevski

geometry of observable lengths that have a power (logarithmic) expression and can be measured in real physical experiments will be presented. These arguments are based on the author's hypothesis about description of the Universe by means of Lobachevski geometry, which includes Euclidean geometry. As one of the confirmations of the author's assumption it is proposed to consider the values of radii of planets and satellites of planets of the Solar system, calculated using the function derived from the Lobachevski geometry.

2.1. Main correlations of Lobachevski's geometry. Function $\lambda(x)$

Consider a summary of the ideas and basic formulas of Lobachevski's geometry. According to Lobachevski, man's comprehension of bodies is given in sensual perception [8,9]. Bodies exist in motion, which is an inherent property of bodies. Geometry as a science, according to the scientist, arose through the idealization of the properties of bodies and the construction of ideal mathematical concepts. A point put on paper, no matter how small. It will always have dimensions. A geometric point is an object devoid of dimensions and exists only in geometry. Similar mathematical abstractions are the concepts of a straight line and a plane.

This geometry was created by Lobachevski in the first half of the 19th century. At that time, the systematic study of the electromagnetic field was just beginning, and the ether was represented as a light-carrying medium. Currently, the idea of ether as a substance with specific properties is being developed in physics at a higher level. According to the author, the geometry of Lobachevski includes the possibility of describing not only physical bodies, but also the structure of the ether.

Consider the definitions of the main concepts of Lobachevski's geometry. A sphere – a multitude of points in a space, placed on the equal distance from a center. A plane is determined due to crossing of two spheres of identical radiuses, which centers are the two fixed points - poles O_1 and O_2 (Fig. 1). The radiuses of these spheres vary from minimum $R_1= R_2 = |O_1A|= |AO_2|$ to infinite.

A circle – a multitude of points in a plane, placed on the equal distance from a center. A circle at radius rising to infinity transits into a limiting circle or a circle with an infinite radius.

A straight line in a plane is defined due to crossing of two circles with equal radiuses, which centers - two fixed points O_1 and O_2 (poles), belonging to this plane (Fig. 2). Radiuses of circles vary from minimum $R_1= R_2 = |O_1A|= |AO_2|$ to infinite. A straight line at any shift

along itself will coincide with itself. Two straight lines in a plane can be crossed and can have the common point.

Parallel lines in a plane are called straight lines, which aren't crossed anywhere at as much their prolongation. Between parallel lines *a* and *b* (Fig. 3) a variable angle of parallelism *P(x)* exists, which depends from length of perpendicular $|AB| = x$ ($AB \perp b$). On the one side parallel lines converge at their prolongation: side of parallelism (on the right).

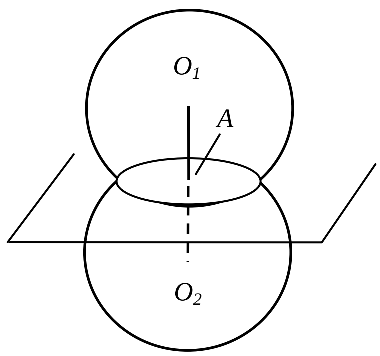

Fig.1

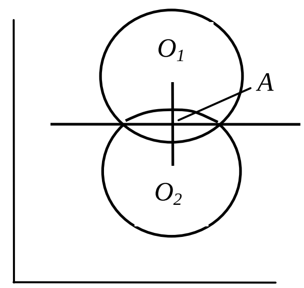

Fig. 2

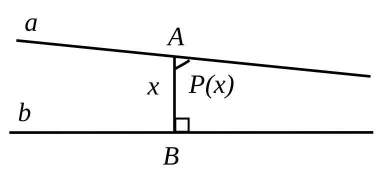

Fig. 3

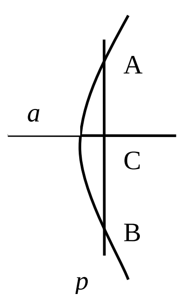

Fig. 4

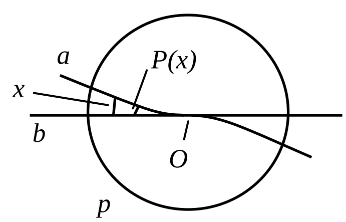

Fig. 5

On the other side parallel lines diverge at their prolongation: side of divergence (on the left). The parallel lines defined by this case, can be imaged only conditionally due to Fig. 3. If a length of a perpendicular rises to zero, then an angle of parallelism *P(x)* rises to the right angle, as it is defined in Euclid's geometry. At increasing of length *x* angle *P(x)* will decrease.

For limiting circle *p* (Fig. 4) an axes of limiting circle – line *a* is determined, perpendicular to chord *AB* and carried out through a middle of chord – point *C*. All axes of limiting circle are parallel among themselves. An axis of a limiting circle is the analogy of a diameter (of circle with final radius). Consider a conditional image of all limiting circle *p* (Fig. 5). Near a center of a limiting circle point *O* two axes of a limiting circle: *a* and *b* (they

are parallel) converge. During this a length of perpendicular x between them rises to zero, and an angle of parallelism $P(x)$ rises to the right angle.

Consider the totality of n limiting circles, for which parallel lines a and b are axes (Fig.6). The limiting circles are placed on equal distance x from each other. For the arcs $l_1, l_2, \ldots l_n$ Lobachevski introduces the correlation:

$$\frac{l_2}{l_1} = \frac{l_3}{l_2} = \ldots = \frac{l_{n-1}}{l_{n-2}} = \frac{l_n}{l_{n-1}} = e^x \qquad (26)$$

Lobachevski think number $e>1$. For the convenience Lobachevski uses the foundation of natural logarithms in all the formulas. We show without proves the main formulas of Lobachevski's geometry. Formula for the definition of the angle of parallelism is the next:

$$\operatorname{tg} P(x)/2 = e^{-x} \qquad x > 0 \qquad (27)$$

$$x \to 0, \quad P(x) \to \pi/2; \quad x \to \infty, \quad P(x) \to 0$$

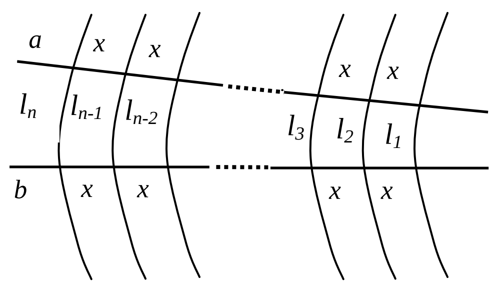

Fig. 6

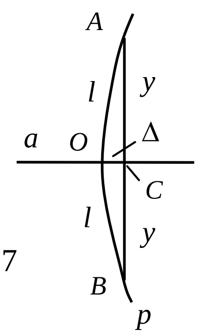

Fig. 7

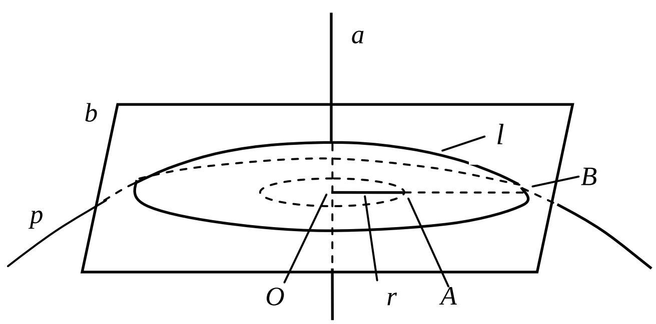

Fig. 8

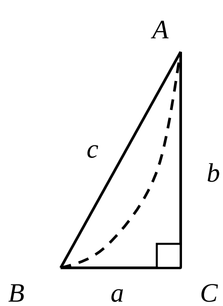

Fig. 9

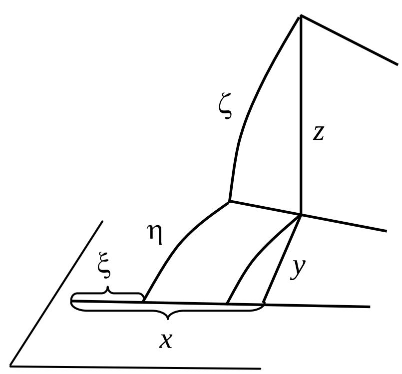

Fig. 10

A length of a circle is founded from the following formula:

$$L = \pi(e^{r} - e^{-r}) \tag{28}$$

r - radius of circle, $r \to 0$, $L \to 2\pi r$; $r \to \infty$, $L \to \pi e^{r}$

The formula for an area of a circle is:

$$S = \pi(e^{\frac{r}{2}} - e^{-\frac{r}{2}})^2 \tag{29}$$

$r \to 0$, $S \to \pi r^2$; $r \to \infty$, $S \to \pi e^{r}$

At radius r, rising to zero, the expressions (28) and (29) coincides with known in Euclidean geometry.

Consider the correlation between an arc and a chord of limiting circle p (Fig. 7): a - axes of limiting circle, AOB -arc, ACB -chord, $|AO|=|OB|=l$, $|AC|=|CB|=y$, $|OC|=\Delta$.

$$l = (e^{y} - e^{-y})/2 \tag{30}$$

$y \to 0$, $l \to y$; $y \to \infty$, $l \to e^{y}/2$

$$e^{\Delta} = (e^{y} + e^{-y})/2 \tag{31}$$

$y \to 0$, $\Delta \to y^2/2$; $y \to \infty$, $\Delta \to y$

A volume of a sphere is expressed as:

$$V = \pi(e^{2r} - e^{-2r} - 4r)/2 \tag{32}$$

r -radius of sphere, $r \to 0$, $V \to 4\pi r^3/3$; $r \to \infty$, $V \to \pi e^{2r}/2$

An area of a sphere surface is equal:

$$S = \pi(e^{r} - e^{-r})^2 \tag{33}$$

$r \to 0$, $S \to 4\pi r^2$; $r \to \infty$, $S \to \pi e^{2r}$

At radius r, rising to zero, the expressions (32) and (33) coincide with known in Euclidean geometry.

Also consider the following results of Lobachevski's geometry. The correlation between sinuses of parallelism angles of a rectangular triangle (Fig. 9) ($\hat{C} = \pi/2$) is expressed in the view:

$$\sin P(a) \sin P(b) = \sin P(c) \tag{34}$$

$$\sin P(x) = 2 / (e^{x} + e^{-x}) \tag{35}$$

Due to formula (35) formula (34) can be written as:

$$4/\{(e^{a} + e^{-a})(e^{b} + e^{-b})\} = 2/(e^{c} + e^{-c}) \tag{36}$$

The sum of angles A and B can be less $\pi/2$, and sum of all angles of a triangle can be less π ($A+B+C<\pi$). At lengths of sides of a triangle rising to zero ($a\to 0$, $b\to 0$, $c\to 0$) the expression (36) transforms into the Pythagorean formula.

$$a^2 + b^2 = c^2 \qquad (37)$$

This sum of triangle angles is equal π ($A+B+C=\pi$). For greatest values a, b, c formula (36) has the view:

$$4 / (e^a e^b) = 2/e^c \qquad (38)$$

$$a + b - \ln 2 = c \qquad (39)$$

The sum of angles A and B decreases and in the limit: $a\to\infty$, $b\to\infty$, $c\to\infty$ rises: $A+B\to 0$. The dotted line in Fig. 9 represents a conditional image of a triangle hypotenuse of very large sizes.

A limiting sphere can be created during a rotation of a limiting circle around the one from axes of a limiting circle. This axis also will be an axis of a limiting sphere. At the crossing of a limiting sphere and a plane can be obtained: 1) limiting circle, if a plane passes through the one from an axis of a sphere, 2) a circle (in all other cases). On a limiting sphere Euclidean geometry is true. Limiting circles are the analogy of straight lines.

Consider the connection of circles, placed on a plane and on a limiting sphere. According to formula (30), at the increasing of chord length $2y$ a length of an arc a limiting circle $2l$ (Fig. 7) will increase very rapidly as $l{\sim}e^y/2$. Therefore this image fig. 7 can show only a conditional performance at small y and l.

In view of an infinitely large radius, a limiting sphere can be expediently presented as close to the form of a plane.

Image the crossing of limiting sphere p and plane b (Fig. 8). A circle of radius r in a plane is (on the definition) a multitude of points, placed on distance r from center O. The dotted line is carried out a circle, which usually imaged in Euclidean geometry. The solid line is carried out a true circle with radius r, which is a result of a plane crossing and a limiting sphere in Lobachevski's geometry. Also through point O an axes of limiting sphere p - line a comes, which is a perpendicular to plane b. The dotted line between points A and B connects a break, which is presented on the figure for a limiting sphere flatting. The images at fig. 8 are conditional, so constructions of Lobachevski's geometry are represented as a flat image of Euclidean geometry.

A length of a circle with radius *r* following to the formula (28) is equal:

$$L = 2\pi \frac{e^{r} - e^{-r}}{2} = 2\pi l \tag{40}$$

On a limiting sphere arc *l* presents a role of a radius, and the formula of the circle length corresponds to Euclidean geometry (on a limiting sphere Euclidean geometry is true). For small radius *r* a circle in Euclidean geometry (dotted line) and a circle on a limiting sphere in Lobachevski's geometry approach and in limit at $r \to 0$ coincide. Than value *r* is more, then much neither the coincidence of these circles.

Consider function characterizing difference of lengths of arc and chord:

$$\lambda(r) = \frac{l}{r} = \frac{(e^{r} - e^{-r})}{2r} = \frac{\text{sh r}}{r} \tag{41}$$

The limit of function at $r \to 0$ is equal: $\lim_{r \to 0} \lambda(r) = 1$. In view of the function construction $\lambda(r)$ as a ratio of two lengths, the one from lengths – the length of chord $2r$ – we can define as the standard of length. Then according to the definition of the observed (measurable) length of a physical body (item 1.2) function $\lambda(r)$ will express an observable length in Lobachevski's geometry.

In tab. 7 the separate values of function $\lambda(x)$ are represented. Present the decompositions of functions: *sh x*, $\lambda(x)$, *ch x* in the Taylor's series near point $x=0$.

$$\text{sh}\, x = (e^{x}-e^{-x})/2 = x + x^3/3! + x^5/5! + \ldots \tag{42}$$

$$\lambda(x) = \text{sh}\, x / x = (e^{x}-e^{-x})/2x = 1 + x^2/3! + x^4/5! + \ldots \tag{43}$$

$$\text{ch x} = (e^{x}+e^{-x})/2 = 1 + x^2/2! + x^4/4! + \ldots \tag{44}$$

The terms of these decompositions $\lambda(x)$ and ch x, containing the identical degrees, differ by the values of the denominators.

At $x \to 0$ $\lambda(x) \to 1$. Define the function $\lambda(x)$ in the point $x=0$ as:

$$\lambda(0) = \lim_{x \to 0} \lambda(x) = 1 \tag{45}$$

The graph of function $\lambda(x)$ is represented in Fig. 11.

Table 7a

x	$\lambda(x)$
0	1
0.5	1.042
1	1.175
2	1.813
3	3.339
4	6.822
5	14.84
6	33.62
7	78.33
8	186.3
9	450.2
10	1101

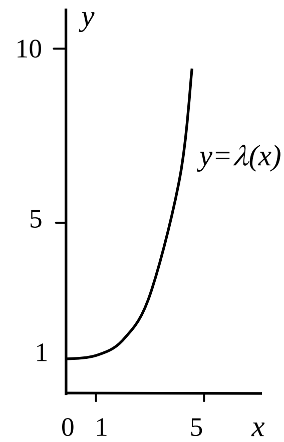

Fig. 11

All formulas of Lobachevski's geometry at lengths rising to zero transit into the corresponding formulas of Euclidean geometry.

In a space Lobachevski uses as the orthogonal coordinate system (x, y, z), so and the system connected to a limiting sphere – the limiting coordinate system (ξ, η, ζ) (Fig. 10). Axis ξ coincides with axis x and is a axis of a limiting sphere. The coordinates η and ζ are arcs lengths of limiting circles possessing to a limiting sphere.

On the whole Lobachevski's geometry transits into Euclidean geometry at lengths rising to zero.

2.2. Introduction of observable lengths in Lobachevski's geometry

Suppose that in nature a very small length exist, at which Lobachevski's geometry transits to Euclidean geometry. Let this is Plank's length (l_P=1.616·10^{-33} cm) - minimum of known in the present. Then at lengths near to l_P Euclidean geometry can be true, and at all lengths bigger l_P, Lobachevski's geometry will work. But at these reasonings we suppose the existence of the one chosen length in nature. According to the hypothesis suggested in the first chapter, in nature the totality of length standards exist. What length we will take as the measurement standard depends from our choice. In other words, all length standards in nature are equal.

Suppose that Lobachevski's geometry can be constructed not from chosen, but from any length using for this purpose function $\lambda(x)$. Think the following view of observable length in Lobachevski's geometry:

$$l(x) = l_k^n \lambda(x) \tag{46}$$

In the formula l_k^n is an observed length defined in Euclidean geometry. At x=0, $\lambda(0)$=1 and length in Lobachevski's geometry coincides with length of Euclidean geometry. At x>0 lengths in Lobachevski's geometry surprise lengths of Euclidean geometry ($l(x) > l_k^n$). Therefore function $\lambda(x)$ connects real Euclidean geometry living in nature and Lobachevski's geometry, which includes Euclidean geometry at $\lambda(x)$=1. But in Lobachevski's geometry a whole spectrum of possible lengths of physical bodes at x>0 may exist.

2.3. Spherical body

Consider a physical body possessing a sphere form with the next radius:

$$R(x)=R_0\,\lambda(x) \tag{47}$$

Value R_0 is an usual radius of a sphere. At x>0 values a radius corresponding to Lobachevski's geometry arise. Represent a sphere for some values x (Fig. 12).

Table 7b

x	$\lambda(x)$
0	1
1	1.175
1.5	1.420
2	1.813
2.5	2.420
3	3.339
3.5	4.726

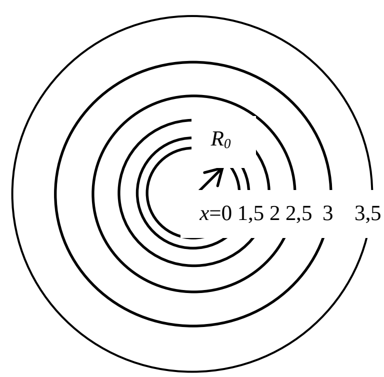

Fig. 12

It is possible to pay attention that the distance between spheres is condensed during drawing near to a sphere (to R_0), and is rarefied during moving off away from a sphere. Note that the step Δx can be taken bigger or smaller.

Many modern scientists suppose the existence of a thin substance – ether. New type of substance can has as discrete properties, so consists from separate particles with defined masses, so can possess by the properties of a continuous medium. In view of this hypothesis, we can suppose that a physical body, having a spherical form, is surround by ether, which is condensed during drawing near and is rarefied during away a body.

2.4. The values of the radii of the planets and satellites of the Solar System calculated using the function $\lambda(x)$

For big half axes of an orbit of planets of the Solar system Johann Titius suggested in 1766 the formula:

$$R_k = 0.4 + 0.3\cdot 2^k \quad \text{(a.e.)} \qquad (48)$$

$$k = -\infty, 0, 1, 2, ..., 8. \qquad 1 \text{ a.e.} = 1.49\cdot 10^{13} \text{ cm}$$

Consider the values calculated due to formula (48), and the values found from the observations of the average distances of the planets from the Sun (tab. 8). The best results (in view of relative error δ) are obtained for the Earth, the Jupiter, the Cerebra (asteroid), the Uranus and the Venus. The visible deviation from formula begins for the ninth planet – the Neptune. The maximum deviation from the formula (approximately in 2 times) is observed for the Pluto.

For the first planet (the Mercury) in the formula (48) value k=-∞ is used. This means that a degree function at an argument changing on unit (Δk=1) can't be used for this planet. The big deviation from the law for last two planets testifies about a slower growth of average radiuses, than it is given by a degree function at an argument changing at unit (Δk=1).

Nikolai Nevesski has investigated for the radiuses of the orbits of the satellites of the Jupiter and the Saturn the using possibility of the function:

$$R_k = a + b\cdot 2^k \qquad (49)$$

$$k=-\infty, 0, 1, 2, ... \quad a, b \text{ –constants}$$

For series of values the good coincidence with the formula (49) was obtained. Remark also the work suggesting the appearance of the quantum (discrete) principles in macrocosm.

Table 8

n	Planet	k	R_k, a.u.	R_n, a.u.	$\delta=\lvert(R_k-R_n)/R_n\rvert$
1	Mercury	$-\infty$	0.4	0.387	0.034
2	Venus	0	0.7	0.723	0.032
3	Earth	1	1.0	1.0	0
4	Mars	2	1.6	1.524	0.050
5	Cerebra (asteroid)	3	2.8	2.77	0.011
6	Jupiter	4	5.2	5.20	0
7	Saturn	5	10.0	9.54	0.048
8	Uranus	6	19.6	19.18	0.022
9	Neptune	7	38.8	30.07	0.290
10	Pluto	8	77.2	39.44	0.957

1 a.u.$=1.49\cdot10^{13}$ cm

Consider the possibility of Lobachevski's geometry using for the description of the radiuses of the planets. Suppose that the orbits have the form of circles and lie in the one plane. In Lobachevski's geometry a body with radius R_0 can be surrounded by a system of spheres:

$$R(x)= R_0 \cdot \lambda(x) \tag{50}$$

At values $x = 0, 1, 2... k$ this is a system of concentric spheres (Fig. 13) with a center in point O. If to conduct through O plane p, then a system of concentric circles in this plane can arise with radiuses defined by formula (50).

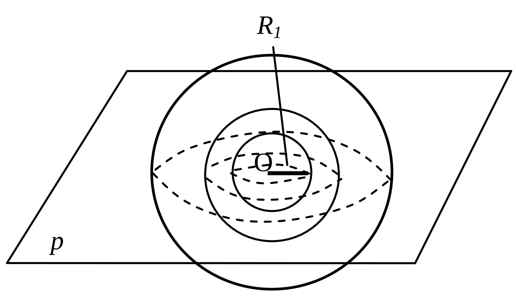

Fig. 13

Consider the radiuses of the planet orbits of the Solar system. As the standard of length we choose the orbit radius of the Mercury. In Lobachevski's geometry the formula for the orbit radiuses can be written as:

$$R(x) = R_1 \cdot \lambda(x) \tag{51}$$

R_1 - standard of length

Present in tab. 9 the values of a orbit radius, found from the observations ($R_1^n = R_n / R_1$), and the values $\lambda(x)=R(x)/R_1$ by the using whole and half whole argument x (the Pluto is exception). The best correspondence (in view of the relative error δ) is obtained for the Mercury (due to the definition), the Neptune and the Venus. The worse results are presented for the Mars and the Jupiter.

It is possible to choose the following groups of planets placed with interval Δx=0.5: 1) the Venus, the Earth, the Mars; 2) the Jupiter, the Saturn; 3) the Uranus, the Neptune. Remark that the planets of the certain group have the close physical parameters. Suppose that the disposition of planets on the precisely chosen orbits written by formula (51), can be connected with the presence of a discrete structure of ether.

***Table 9.* Planets**

n	Planet	R_n, a.u.	$R_1^n = R_n / R_1$	$\lambda(x)=R(x)/R_1$	x	$\delta = \left\|(\lambda(x) - R_1^n)/R_1^n\right\|$
1	Mercury	0.387	1	1	0	0
2	Venus	0.723	1.868	1.813	2	0.029
3	Earth	1.000	2.584	2.420	2.5	0.063
4	Mars	1.524	3.938	3.339	3	0.152
5	Cerebra (asteroid)	2.77	7.158	6.822	4	0.047
6	Jupiter	5.20	13.44	14.84	5	0.104
7	Saturn	9.54	24.65	22.24	5.5	0.098
8	Uranus	19.18	49.56	51.16	6.5	0.032
9	Neptune	30.07	77.70	78.33	7	0.008
10	Pluto	39.44	101.91	97.11	7.25	0.047

***Table 10.* Satellites of the Jupiter**

n	Satellite	R_n, 10^3 km	$R_1^n = R_n / R_1$	$\lambda(x)=R(x)/R_1$	x	$\delta = \left\|(\lambda(x) - R_1^n)/R_1^n\right\|$
1	Adrastea	128	1	1	0	0
2	Metes	128	1	1	0	0
3	Amaltea	181	1.414	1.420	1.5	0.004
4	Five	221	1.727	1.813	2	0.050
5	Io	422	3.297	3.339	3	0.013
6	Europe	671	5.242	4.726	3.5	0.098
7	Ganymede	1070	8.359	8.246	4.25	0.014
8	Callisto	1880	14.69	14.84	5	0.010
9	Leda	11110	86.80	78.33	7	0.098
10	Gimalia	11470	89.61	89.10	7.15	0.006
11	Lisitea	11710	91.48	93.02	7.2	0.017
12	Elara	11740	91.72	93.02	7.2	0.014
13	Ananke	20700	161.7	163.4	7.85	0.011
14	Carme	22350	174.6	170.7	7.9	0.022
15	Pacife	23300	182.0	186.3	8	0.024
16	Sinope	23700	185.2	186.3	8	0.006

Table 11. **Satellites of the Saturn**

n	Satellite	R_n, 10^3 km	$R_1^n = R_n / R_1$	$\lambda(x)=R(x)/R_1$	x	$\delta = \left\|(\lambda(x) - R_1^n)/R_1^n\right\|$
1	Janus	159.5	1	1	0	0
2	Mimas	186	1.166	1.175	1	0.008
3	Encelad	238	1.492	1.420	1.5	0.048
4	Tefia	295	1.850	1.813	2	0.020
5	Diona	377	2.364	2.420	2.5	0.024
6	Rea	527	3.304	3.339	3	0.011
7	Titan	1222	7.661	7.357	4.1	0.040
8	Giperion	1481	9.285	9.254	4.4	0.003
9	Japet	3560	22.32	22.24	5.5	0.004
10	Feba	12930	81.07	78.33	7	0.034

Table 12. **Satellites of the Uranus**

n	Satellite	R_n, 10^3 km	$R_1^n = R_n / R_1$	$\lambda(x)=R(x)/R_1$	x	$\delta = \left\|(\lambda(x) - R_1^n)/R_1^n\right\|$
1	Miranda	130	1	1	0	0
2	Ariel	192	1.477	1.420	1.5	0.039
3	Umbriel	267	2.054	2.085	2.25	0.015
4	Titania	438	3.369	3.339	3	0.009
5	Oberon	586	4.508	4.726	3.5	0.048

Realize the calculation of the orbits of the radiuses of the satellites of the Jupiter, the Saturn and the Uranus due to formula (51) [10,11]. The values of the radiuses the orbits $R_1^n = R_n / R_1$ and the values $\lambda(x)=R(x)/R_1$ are represented in tables 10-12. As the standard of length R_1 the first satellite length in the table is used. For a majority of values $\lambda(x)$ whole and half whole values of argument x were used. For the series of the satellites the best correspondence is obtained at the using of decimal part x, and also number 5 in the 100th part x.

At the satellites of the Jupiter the best coincidence (in view of relative error δ) is obtained for the Adrastea (1) and the Metis (2) (by means of the definition), the Amaltea (3), the Sinope (16) (the satellites with whole and half whole x were taken into a consideration). The worst coincidence is presented for the Europe (6) and the Leda (9).

At satellites of the Saturn the best coincidence (with use δ) is obtained for the Janus (1) (by means of the definition), the Japet (9) and the Mimas (2) (the satellites with whole and half whole x) were taken into a consideration). The worst result is for the Encelad (3).

At satellites of the Uranus the best coincidence (in view of δ) is obtained for the Miranda (1) (by means of the definition), the Titania (4) and the Umbriel (3). The worst result is for the Oberon (5).

There are the following regularities for argument values x: 1) satellites of the Saturn: the Mimas (2), the Encelad (3), the Tefia (4), the Diona (5), the Rea (6) are placed with interval x=0.5; 2) there are groups by 2 satellites with interval x=0.5: by the Jupiter: the Amaltea (3) and the Fiva (4), the Io (5) and the Europe (6), at the Uranus: the Titania (4) and the Oberon (5).

In the result of the calculation consideration of orbit radiuses of the planets of the Solar system and an orbit radius of the satellites of the Jupiter, the Saturn and the Uranus due to function $\lambda(x)$ we present the following conclusions:

1) For the series of the planets and the satellites the disposition regularity with interval Δx=0.5 exist;

2) The best description of an orbit radius due to the function $\lambda(x)$ is observed for the five satellites of the Saturn, that, perhaps, is connected with the presence of circular orbits lying on the equator plane of the Saturn.

In view of the existence of the series of a planet radius and a planet satellite of the precisely expressed periodic structure, it is possible to make the supposition about the presence of a discrete structure of ether.

2.5. Proportion of main characteristic lengths

Consider in the proportion (26) as values l_k lengths of the view $l_k=e^{5k}$ (k- integer number). Proportion (26) can be rewritten as:

$$\frac{l_2}{l_1}=\frac{l_3}{l_2}=...=\frac{l_{n-1}}{l_{n-2}}=\frac{l_n}{l_{n-1}}=e^5 \qquad (52)$$

A geometric explanation of this proportion can be the image in Fig. 6, on which values l_k will be lengths of arcs of limiting circles (distance between limiting circles is equal x=5).

An observable length was defined in (item 1.3) as: $l_k^n = l_n / l_k = e^{\alpha(n-k)}$ n, k –whole numbers. The main characteristic lengths have the view: $l_k^n = e^{5(n-k)}$. The proportion (52) can

be considered as the proportion of the main characteristic lengths, if as the one from lengths, included in the proportion, we choose as the standard of length and divide on it all the lengths. At the choice as the length standard l_1 the proportion (52) can be written in the view:

$$\frac{l_1^2}{l_1^1} = \frac{l_1^3}{l_1^2} = ... = \frac{l_1^{n-1}}{l_1^{n-2}} = \frac{l_1^n}{l_1^{n-1}} = e^5 \tag{53}$$

The proportion (53) will be the proportion of the main characteristic lengths. Consider the property of this proportion. Fix all the lengths in the proportion (53) and multiply all the lengths at scale factor a (real number $0<a<+\infty$). The view of this proportion will not change. Present the appearance of the proportion (53) in matrixes L_n and $L(\alpha,n)$ (item 1.3).

$$L_n = \begin{vmatrix} l_1/l_1 & l_2/l_1 & l_3/l_1 & & \cdots & l_n/l_1 \\ l_1/l_2 & l_2/l_2 & l_3/l_2 & & \cdots & \cdots \\ l_1/l_3 & l_2/l_3 & l_3/l_3 & & \cdots & \cdots \\ \cdots & \cdots & & \cdots & \cdots & \cdots \\ l_1/l_{n-1} & \cdots & & & l_{n-1}/l_{n-1} & l_n/l_{n-1} \\ l_1/l_n & \cdots & & & \cdots & l_n/l_n \end{vmatrix} \tag{54}$$

$$L(5,n) = \begin{vmatrix} 1 & e^5 & e^{10} & . & . & . & e^{n-1} \\ e^{-5} & 1 & e^5 & . & . & . & . \\ e^{-10} & e^{-5} & 1 & e^5 & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & . & . \\ . & . & . & . & . & 1 & e^5 \\ e^{-(n-1)} & . & . & . & . & e^{-5} & 1 \end{vmatrix} \tag{55}$$

On the main diagonals of matrixes (54) and (55) the units are. The elements of the proportion (53) in the matrixes are located on the diagonal, which placed over the main diagonal.

Each length in matrix (54) can be multiplied as well as in the proportion (53) at the scale factor a, but the view of matrixes L_n and $L(5, n)$ and the values of the observable lengths at this scale transformation will not change.

2.6. Summary

In this chapter the author considered the most nodal, essential points necessary to establish the relationship between Lobachevski geometry and natural lengths. A closer connection requires a detailed analysis of the provisions of geometry and its various sections. Let us present the main assumptions outlined in this chapter:

1) The length of a physical body can be expressed by any real number l_k , belonging to the range: $0 < l_\kappa < +\infty$.

2) Because of the existence in nature of a set of physical bodies and correspondingly a set of lengths, it is possible to establish proportions of the form: l_i / l_j between the lengths.

3) The length of any physical body can be chosen as the standard of length. The length observed and measured in the experiment is expressed by a real number: l_n - the length of the body, l_k - the length of the standard.

4) Between the main characteristic lengths of physical bodies, presented in power form, it is possible to establish proportions of the form:

$$l_n / l_{n-1} = l_{n-1} / l_{n-2} = \ldots = l_3 / l_2 = l_2 / l_1 = e^5$$

In Lobachevski geometry the lengths l_k , entering a proportion, are represented by arcs of limiting circles enclosed between two parallel lines. The distance between adjacent limiting circles is x=5.

5) In view of the relation between the arc length of the limiting circle and the chord length in Lobachevski geometry, which is expressed by the function $\lambda(x)$:

$$\lambda(x) = \frac{l}{r} = \frac{(e^x - e^{-x})}{2x} = \frac{\text{sh x}}{x} \qquad x>0; \qquad \lambda(0)=1,\ x=0$$

The observed lengths of physical bodies in Lobachevski geometry have the form:

$$l(x) = l_k^n \lambda(x)$$

At x=0, $\lambda(0)$=1 and the values of the lengths coincide with those used in Euclidean geometry, at x>0 there is a spectrum $l(x)$ values inherent in Lobachevski geometry. The expression of the observed lengths in Lobachevski geometry has a power form.

3. Model of natural events

The Universe surprises by it sizes: time of the light way from the one end of the Universe to another consists of billions years, in galaxies – this is tens and hundreds thousands of years. If information and interactions move with the light velocity, then in the scale of the Universe events appears very slowly. How do different parts of the Universe to connect? As does the Universe to synchronize, how does simultaneity to place in it? Probably, the similar reasonings had impelled by astrophysics Nikolai Kozyrev to the hypothesis existence of flow of time or space flow [5]. Perhaps, researches in the range of astronomy inspire just on similar reasonings about the construction of the Universe on the whole. Kozyrev has created his flow by the properties of the instant synchronism of all the Universe suggesting that "… from the view point of time, the Universe presents a point". Kozyrev tried to realize astronomical and laboratory experiments of the registration of space flow. Undoubtedly, the experiences had unique methods and new sights. At the realization of similar experiments it needs to come out the traditional frameworks. In spite of the fact of difficulties, in the present the experiments close to the experiments of Kozyrev on the physical interpretation was carried out.

Remark that the idea of very large and even an infinite velocity of an interaction had arisen in physics much earlier. Isaac Newton supposed the possibility of transference of gravitational interactions between bodies in the cosmic space with an infinite velocity. Then this point of view was usually called as a long-range action and implied transference of an interaction without an intermediate medium between bodies and had the supporters. In the present the theory of long-range action also is connected with the theory of direct inter particle interaction, which develops the idea of a direct interaction between bodies at any distances.

At the same time, in physics from ancient times there is an idea of a property of a space filling up by a substance – ether. According to this hypothesis, everywhere in the Universe there is ether – a specific medium and between all known bodies there is no an emptiness. The modern researches supposed that ether has properties as a continuous medium, as discrete (quantum) properties. Usually theories of a long-range action and ether were considered separately. On the author's opinion, the idea of a long-range action as the possibility of the installation of the general connection in the Universe and the idea of ether as the absence of an emptiness in a space can supplement each other.

Suppose that the existence of the principle of synchronization of events in nature, due to this assumption, all events appearing in the Universe can be made instantaneous. So, this possibility of synchronization of events shouldn't depend from a distance. As at any event a body presents, this principle also allows showing interactions between bodies independently from a distance.

3.1. Point event. Information of event. Flow of events

The events of our life are located in the present, the past, and the future. In the future, they are plans, forecasts. In the present, events come true and become credible. In the past, events are accumulated in various types of memory, exist in the form of knowledge, experience. As a result, we are dealing with future, present and past events. These events are interconnected and exist in unity.

Remark that the duration region of different natural events is extraordinarily great. It is possible to find pairs of events distinguishing on many orders, for example: the lifetime of a man (70 years) and the lifetime of a star ($\sim 10^9$ years), the Plank's time ($\sim 10^{-44}$ s) and the meson lifetime ($\sim 10^{-6}$ s). Each smaller event can be presented in these pairs as very small or point. By these conditions we idealize a small event, neglect its internal structure and organization. Think that a point event doesn't contain the time duration and has a physical value - information (I). Suppose the presentation of information on the language of multitudes.

In life each day we can observe a great number of happening and happened events. Some events are in the future, they haven't taken place yet, but are becoming closer, are gaining more and more clear, palpable features. One can think that events draw near to us from the future and go away to the past, or flow of events exists. Image point events in the present, in the future and in the past (Fig. 14). We use one space axis l / l_k (l_k -standard of length) and one time axis (t_k -standard of time).

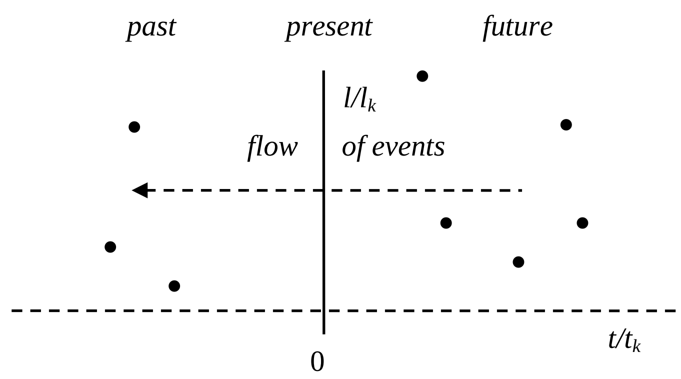

Fig. 14. Flow of events

3.2. Trustworthiness. Border of trustworthiness. Multitude of instant events. Space of events

Events are drawing near to us from the future and are appearing in the present. Enter a value characterizing the achievement of an event of the future in the present: *D*-trustworthiness or probability.

In our life a series of events exist, which appear day-to-day. There are events, which we so have got used, that we perceive them as due, itself understanding, and in them happening we don't doubt any more. There are, for example, a turn of the Earth around of its axis (coming of the new day), the motion of the Earth around the Sun (coming of New Year), and motion of the other planets of the Solar system etc. Less certain events are, for example: a motion of a transport on a schedule, transmissions of television, radio etc.

The point events are drawing near from the future to the present or to the line (fig. 14), characterizing their achievement, where they gain the biggest trustworthiness. Designate this boundary – the border of trustworthiness or the present. For values of D it is expedient to define values: $0<D<1$ for point events of the future, $D=1$ for point events on the border of trustworthiness and point events of the past.

In the future a value of trustworthiness can change its value. If the point event appears, then it gains on the border of trustworthiness the value $D=1$. If the event doesn't happen, then on the border of trustworthiness its value becomes $D=0$.

Information of the future isn't defined exactly ($D<1$), it is subjected to changing, making more precise, planning. In view of this fact, information of separate point events can be variable values. Opposite, point events on the border of the trustworthiness and in the past

gain trustworthiness D=1. These point events it is expediently to think as “congealing”, and their information we will think constant values.

Earlier we suppose that the synchronization of events is possible in the Universe. Think that synchronized point events can form a multitude of instant events or a surface of trustworthiness P (Fig. 15). But also point events will stay, not belonging to this multitude. There are events, which have happened earlier or later in time, than synchronized point events. Therefore, if the multitude of synchronic events associates with the present moment, then other events will be placed earlier, or later in time on surfaces: P_1 placed in the future, and P_2 placed in the past (Fig. 16).

It was supposed that events move from the future to the present, and then to the past or flow of events exists. It means the motion all multitudes of instant events (surfaces of trustworthiness) from the future to the past.

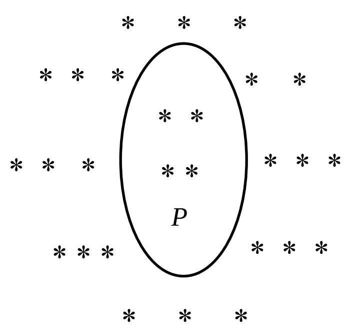

Fig. 15. Multitude of instant events

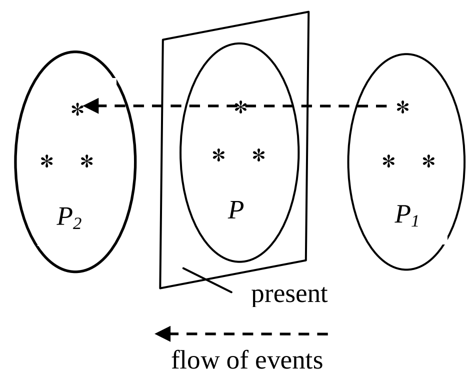

Fig. 16. Motion of multitudes of instant events in space of events

Suppose that the physical bodies were in each multitude of instant events, can be described by Lobachevski’s geometry containing the three spatial coordinates.

All the totality of multitudes of instantaneous events (surfaces of trustworthiness) will organize space of events. In other words, space of events can be the fullest multitude of point events.

3.3. Connecting

All point events are connected, are interlaced among themselves (Fig. 17). The connections are in dynamics: then amplify, then weaken. May suppose the connection

existence of anyone point event with all others, which are infinite much. The difference can consist in a force, in a stability of these connections.

As a value characterizing the connection of two events, we consider a connecting or coefficient of the information connection of point events C. In view of dynamics of all picture of space of events coefficient C will be variable value. The number of connections of one point event can be really limited in view of smallness C with the defined number of point events. The value of connecting is in the region: $0 \leq C \leq 1$.

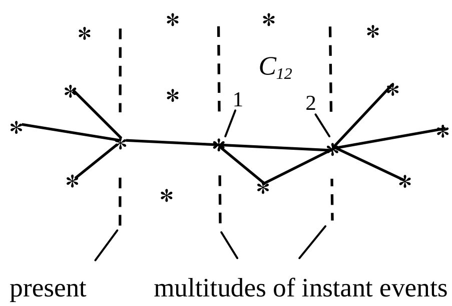

Fig. 17. Connecting of point events in space of events

Pay the attention that a connecting is carried out between point events without the dependence from time and space. For example, imaged in Fig. 17 point events 1 and 2 achieve the border of trustworthiness not instantly: 1 - earlier, and 2 - later. Also they can be placed in different points of the space after the achievement of the present (the border of trustworthiness).

Consider concept of connecting in the traditional representation. A taking between people usually is carried out with the help of sound waves. Large information acts with light and through electromagnetic waves of other ranges (radio, television). In other words, information connection in our presentation is information interchange between different natural objects. On the language of events a connecting will mean information changing of point events. For example, part of information from the point event 1 (Fig. 17) can pass to the point event 2. In result they will have common information $I_o = I_1 \cap I_2$. By the dependence from the magnitude C an amount of common information can vary.

3.4. Difference

As a value characterizing the incompatibility of point events, we will consider difference R. Two identical events, possessing identical information (I_1=I_2), are indistinguishable and are represented in space of events as the one point. All other events will be different ($I_1 \neq I_2$).

As an example we will consider information of n point events:

$$I_1,\ I_2\ ...\ I_n$$

Let these point events are different, and I_0 - common information of these point events:

$$I_0 = I_i \cap I_j \quad \text{for anyone} \quad i, j = 1, 2\ ...\ n$$

Then information (I_k-I_0) will be peculiar only to this point event and can characterize a difference. Define difference of point event for this example in the view:

$$R_k = I_k - I_o \qquad (56)$$

It is possible to find examples of very similar against each other events, which will be identical. It means that only the part of information is used, which coincides, so it is identical. Other information doesn't interest us. But each object of nature: a man, a tree, a stone etc., contains nuances, which peculiar only to him (it). Even if we deal with two twins, nevertheless a very small difference one from another will be.

Perhaps, in nature identical events can't be observed. Small information can be founded as characteristic only to this point event.

Monotonous events contain close information and following, a difference close to zero. Sometimes a deceleration feeling of time arises, or it stopping. This can be arisen by the alternation of very similar against each other events. On the contrary, for bright, unusual events, which weren't in our life earlier, their information I can be essential to differ from information of a common background of events. In the result a difference can be an important characteristic of the correlation between information of point events.

3.5. Initial suppositions for creating space of events

Earlier the common description of space of events was represented. We consider the initial suppositions, which it is suggested to decide as the basic in space of events.

1. Point event – an elementary object of space of events.

2. Space of events – the fullest multitude of point events, the totality of all point events.

3. I - information of point event - a basic characteristic of point event in space of events.

4. R - difference characterizes a distinction of point events in space of events. For two point events (i and j): $R_{ij}= I_i - I_j$ (R=0 for identical events, $R\neq 0$ for not identical events).

5. C – a connecting of point events, characterizes connections, information interchange between point events in space of events. The connecting accepts values in the region: $0<C<1$ (C=O for not connecting point events, C=1 full connecting).

6. D - trustworthiness (probability) of point event, determines the achievement of point event of the future in the present. Trustworthiness characterizes a presentation, a knowledge, a prognosis of these events. So D=1 is for trustworthy events (supposition 8), $0<D<1$ for uncertain events, D=0 for point events not existing in space of events.

7. The border of trustworthiness (the present) divides space of events on the two regions:

1) The region of the future – not happening, supposed point events. Trustworthiness of these events is in the range: $0<D<1$ (the trustworthiness events consists the exception (supposition 8)).

2) The region of the past –appearing, known point events, which trustworthiness accepts value D=1. Information of each point events in the region of the past is constant value. Point events on the border of trustworthiness (the present) happen and gain the value D=1, or don't happen and accept the value D=0.

8. Trustworthy events - point events, which can be placed in any region of space of events (of the future, or the past) or on the border of trustworthiness. They have the following properties:

1) D=1;

2) They form numerical series of the view: $...-2\alpha, -\alpha, 0, \alpha, 2\alpha, 3\alpha, ...$

$x=\alpha k$ - element of series of trustworthy events, α - coefficient of series, real number ($0 <\alpha< +\infty$), k – ordinal number of trustworthy event, whole number;

3) Information of trustworthy event: $I=\{I_0, \alpha k\}$, I_0 - own information of a trustworthy event, constant value, $x=\alpha k$ - element of series of trustworthy events.

9. From all the totality of series of trustworthy events any series of trustworthy events can be chosen as the standard series.

10. The connection between the two series of trustworthy events is installed due to the ratio of coefficients of series: α_i / α_j.

11. Multitude of instant events (a surface of trustworthiness) – the unification of the following multitudes of point events:

1) Multitude of trustworthy events possessing equal value $x=\alpha k$, but different values α, k, I_0.

2) Multitude of point events, which information contains the same value $x=\alpha k$, as the multitude of trustworthy events.

12. Information of point event contains own information I and value $x=\alpha k$, indicating belonging to the certain surface of trustworthiness: $I_k = \{I, \alpha k\}$.

13. Point events of a multitude of synchronous events have no a time difference (all point events are instant, synchronous), but can possess other types of difference.

14. Between any two trustworthy events (surfaces of trustworthiness) in space of events it is possible to place any number n of trustworthy events (surfaces of trustworthiness) n: 1,2,3 …+∞.

15. On the border of trustworthiness (the present) can be only the one multitude of instantaneous events (the one surface of trustworthiness).

16. There is flow (motion) of multitudes of instant events (surfaces of trustworthiness) through the border of trustworthiness (the present) from the region of the future to the region of the past.

17. The distance between two point events, belonging to various multitudes of instantaneous event express as: $\Delta x= \alpha(n-k)$, α - coefficient of a series of trustworthy events; n, k - numbers of terms of series of trustworthy events.

18. Step – a shift of all multitudes of instantaneous events in space of events on the fixed distance to the direction of flow. In the region of the future the shift appears to the border of trustworthiness, in the region of the past - from the border of trustworthiness.

19. For information interchange between any two (and more) point events step it needs a in space of events.

20. Physical bodies, belonging to the defined multitude of instantaneous events (a surface of the border of trustworthiness), are described by geometry of Lobachevski.

3.6. Trustworthy events

In space of events it is needed to introduce the foundation, the basis, on which the further construction of the space will be formed. For this we will consider the most simple on its structure point events - trustworthy events (supposition 8). In the defined region of space of events the trustworthiness of these events is equal D=1. Information of trustworthy events expresses as:

$$I = \{I_0, \alpha k\} \qquad (57)$$

Where I_0 - own information of trustworthy event – a constant value is. Coefficient of series α (real number, $0<\alpha<+\infty$) characterizes the defined series of trustworthy events.

The series of trustworthy events in space of events can contain a finite number of trustworthy events (Fig. 18) (N_{min}, N_{max} - finite, whole numbers).

------*--- …----*---*---*---*----*---- … ---*-----

$N_{min}\alpha$ -2α $-\alpha$ 0 α 2α $N_{max}\alpha$

Fig. 18

What real events can be put in the correspondence to these idealized trustworthy events in nature? Consider the process, which is used for a measurement of time: the course of mechanical clocks. Suppose that the period of oscillations 1 s corresponds to a shift of the second hand on 1 division. As I_o it is possible to define, for example, maximum amplitude of a shift of the balancer a. At the enough exact control of clocks this value will have insignificant deviations from the oscillation to the oscillation. So our idealization the supposition will be, that I_o is precisely fixed from the oscillation to the oscillation, though in nature it isn't the true enough.

In view of the existence of flow of all point events (supposition 16), trustworthy events will move constantly from the region of the future to the border of trustworthiness, and from the border of trustworthiness to the region of the past (Fig. 19), i.e. the course of time exist. Think that the one from the series of trustworthy events is always on the border of trustworthiness (supposition 15). A final number of trustworthy events of a series can be placed in the region of the future. But in nature certainly one can't act, so never full guarantee will be (i.e. D=1), that these trustworthy events precisely will appear on the border of

trustworthiness. Any clocks can stop by any reasons. But a series of trustworthy events is the idealization, the agreement, the model, which is needed in space of events.

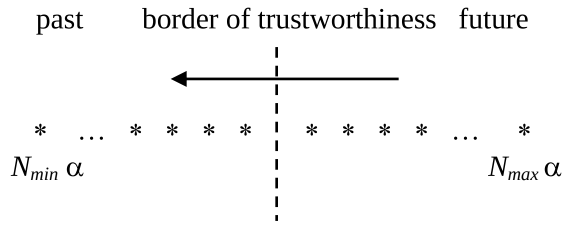

Fig. 19

Untrustworthiness events in the region of the future will contain already smaller idealization, since their trustworthiness is (0<*D*<1). If at any step the trustworthiness becomes *D*=0, then the point event disappears from space of events.

A point event in the region of the future has a trustworthiness as a characteristic of its reality, verisimilitude. A point event can change its trustworthiness in the range: 0<*D*<1. At the coming nearer to the border of trustworthiness a point event can increase own trustworthiness and appears on the border of trustworthiness (to take value *D*=1), or to decrease trustworthiness and doesn’t appear (gain value *D*=0 on the border of trustworthiness).

Between any two near positions of the second hand or between two trustworthy events the hand places intermediate positions. In other words, between any two near trustworthy events of this series it is possible to place other trustworthy events (supposition 14). Perhaps, it is expediently doesn’t to limit a maximum number of trustworthy events, which can be placed between two trustworthy events.

3.7. Presentation of the future

In space of events the future exists, lives by own life. Point events arise, change its information, a trustworthiness, a connecting with other point events. Any area of the future can’t be absolutely precisely known, so all information containing in point events of this region of the future will not be defined, and the trustworthiness of point events will be less unit (*D*<1) always. From this point of view, series of trustworthy events continued to the future and having *D*=1, undoubtedly, are the idealization necessary for the creation of the fulcrum, the basis in space of events.

Many natural phenomena are investigated sufficiently well. There are the laws, which are fulfilled by day-to-day, and their truth doesn't call a doubt. In view of this fact, phenomena calculated mathematically on these laws and placed in space of events in the region of the future, will have a trustworthiness close to unit (D<1). In other words, their representation in space of events will approach to trustworthiness events, i.e. to absolutely precisely happening events on the border of trustworthiness. But it always will be an idealization, our model of the future, index of that level of the science development on which the description of the future appears. The absolutely exact knowledge of full information of a defined region of the future (D=1) will except the stimuli, the aspiration for the further cognition, to the existence, to the development.

3.8. Fractional triangle

Consider a construction from fractions which are carried out as follows. Take an ordered combination from two fractions, which sum is equal to the unit:

$$(C_1 C_2) \qquad\qquad C_1 + C_2 = 1$$

For example: (1/2 1/2) (1/3 2/3) (2/3 1/3). Place combinations at a denominator increasing and dispose them in triangle (fig. 21). On the axis of fractional triangle through one line the most symmetrical combination (1/2 1/2) is repeated. To any combinations (C_1 C_2) to the left of the axis are corresponded by the symmetrical combinations (C_2 C_1) to the right of the axis.

The construction principle of the fractional triangle implies a constant increasing on unit of a number of combinations in a line. At this the denominator of a fraction increases at the unit. Fractional triangle constantly mixes, grows. This regularity can be traced, observing constant increasing of the triangle (Fig. 22a) consisting from combinations:

(1/2 1/2) (1/3 2/3) (2/3 1/3) (1/4 3/4) (3/4 1/4)

The smallest triangle places on the top of the fractional triangle. Then it constantly increases in sizes (Fig. 22b). Remark that all the triangles are similar.

A hierarchy of the construction of the fractional triangle reminds a hierarchy usual to many natural systems. The combination (1/2 1/2) standing in the first line on the top of triangle has the largest, the high position in hierarchy. In the second line the combinations (1/3 2/3) and (2/3 1/3) are placed. They will be symmetric relatively of the vertical axes. But

if to consider combinations (1/3 2/3) (second line) and (3/4 1/4) (third line), then will be difference in a hierarchy: the one combination will be higher another and the combinations will be asymmetric.

Thus, it is possible to consider as combinations placed in the one line at the different distance from the vertical axes, so placed in different lines of the fractional triangle.

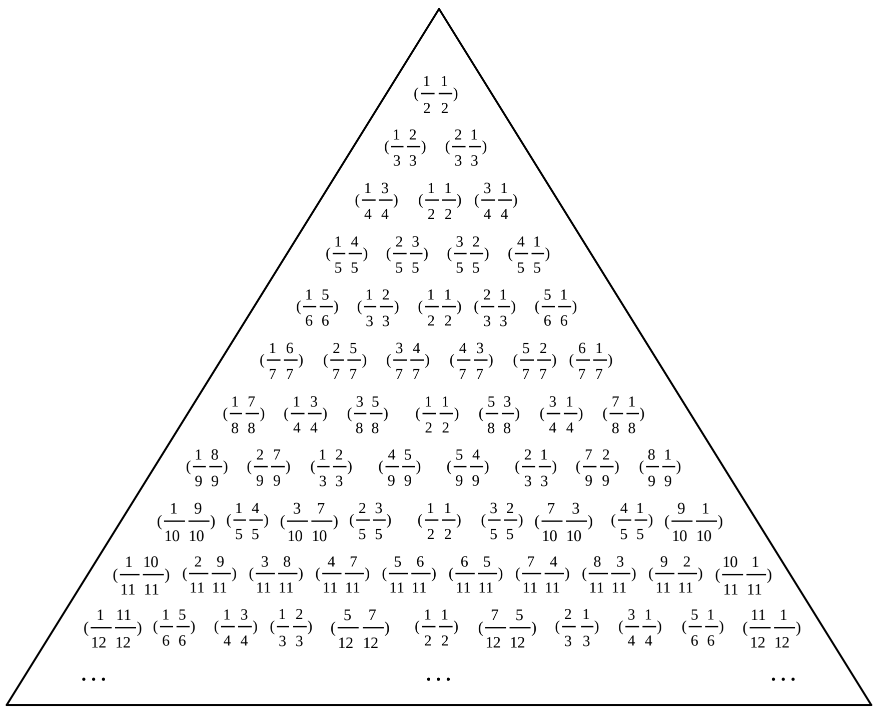

Fig. 21. Fractional triangle

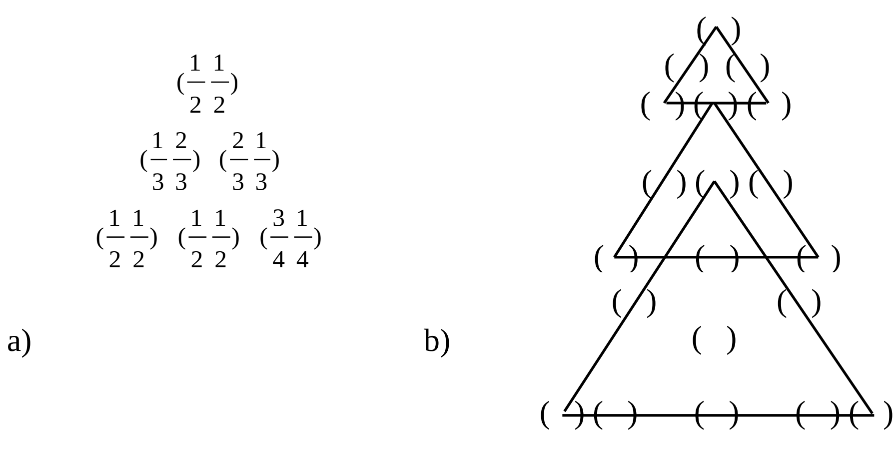

Fig. 22. Structure of fractional triangle

3.9. Point events and fractional triangle

The natural systems in space of events will be represented by multitudes consisting from point events. Consider as a possible characteristic of point event a pair of numbers (C_1 C_2) of the fractional triangle. In the fractional triangle all possible combinations of these numbers are placed. The location of a fixed combination of numbers is determined by numbers (C_1 C_2) and line number k (index of hierarchy). Chosen combination {(C_1 C_2), k} we can express a position in a hierarchic structure. The index of hierarchy k allows to enter a consideration of a hierarchic structure of multitudes of point events. To the combination {(C_1 C_2), k} corresponds the symmetrical combination {(C_2 C_1), k}. At the same time, the case of full (absolute) symmetry for the elements {(1/2 1/2), k} exist. In the result element {(C_1 C_2), k} can characterize symmetry (or asymmetry) of certain point events, and also multitudes of point events.

3.10. Motion of point events in space of events

The model of the future in space of events is suggested as a very flexible, active formation, which constantly moves, constantly lives, breathes, and reorganizes. In nature the supposed event can change it position, i.e. or it is planned for this day, but can be transferred for two days, for one week forward etc.: in other words, the event disappears from one place of the future region and appears in another place (relatively of the sequence of trustworthy events), or this point event can exist with defined, tasked by us the trustworthiness in different places of the future.

Point events constantly flow, move to the present (the border of trustworthiness) in the region of the future and from the border of trustworthiness in the region of the past. The point events of the past save constant itself information, but their connecting or information interchange with point events of the future and the present can change. In other words, information of certain regions of the past will be the memory of happened events and exists in the constant view in space of events, but the use of information of the past will depend from a connecting with other areas of space of events.

A physical body is a multitude, consisting from point events, and places in different instant multitudes of space of events. Due to connecting all the point events of this body are connected among themselves, and also with other bodies.

In result events of the future, the present and the past are connected, are communicated in space of events, as far they were in our presentation.

3.11. Summary

In this chapter, the author wanted to portray the picture of the Universe with maximum clarity in the language of the model of natural events. Therefore, in some places the style of presentation doesn’t have sufficient rigor.

Let us consider the main content of the model of natural events. An event existing in nature is represented as an idealized concept - a point event endowed with a physical characteristic - information. It is assumed that the totality of events in the Universe, occurring in the present, can be synchronized, simultaneous and belongs to the set of instantaneous events in the model. The metric properties of bodies in the synchronous set are described using Lobachevski geometry. The existence of other sets of instantaneous events in the future and the past is also allowed. Events in the future possess a degree of possibility or probability of occurrence in the present, so future events are endowed with a physical quantity - trustworthiness (probability). Present and past events are considered accomplished, fully determined, and have the greatest trustworthiness.

The model assumes motion, the flow of future events through the present into the past. The totality of events in the Universe forms the most complete set - the space of events. Events have the following properties: connecting, which implies information exchange and interaction between events, and difference, which characterizes the distinctive features of event information.

The outlined scheme contains the main points, statements, necessary, in the author's opinion, to build the model.

Conclusion

As a conclusion the author would like to formulate the main conceptions and hypotheses of this work.

1. It is proposed to choose characteristic lengths from the totality of natural lengths. Any length of any physical body can be taken as a length standard. It is assumed that all lengths in nature are equal and there is no singular length. The best regularities on the logarithmic scale appear in relations between fundamental physical constants reduced to the form of the ratio of length to the Compton length of the electron: $\ln \frac{l}{\lambda\!\!\!^{-}_e} \approx 5n + 0{,}5k$ (n, k – integer number). It is proposed to consider the lengths of physical bodies on a logarithmic scale, where $\alpha = 5$ as the main scale is taken.

2. Introduction of observable lengths in Lobachevski geometry is possible due to the use of the power function $\lambda(x)$. It is assumed that the Universe is described using Lobachevski geometry, which includes Euclidean geometry. In view of the equality of natural lengths, the transition to Lobachevski geometry is possible at any chosen length.

3. The existence of the principle of synchronization of point events on cosmic scales is assumed. Synchronous point events belong to the set of instantaneous events. The metric properties of each instantaneous set are described by Lobachevski geometry. The whole set of instantaneous event sets forms the space of events. The course of time is represented as the movement of the flow of sets of instantaneous events from the future to the past.

It should be noted that some statements of this work are to be developed and supplemented. At the same time, the author sees his task in connecting this work with modern physical theories.

References

1. Davies P.C.W. The accidental universe. Cambridge University Press, Cambridge, 1982.
2. Einstein A. On the principle of relativity and its consequences (1907). Compl. works, Nauka, Moscow, 1965, Vol.1, pp.65-115.
3. Weinberg S. Gravitation and cosmology. Massachusetts Institute of Technology, Massachusetts, 1972.
4. Zeldovich J.B., Novikov I.D. Structure and evolution of the Universe. Nauka, Moscow, 1975.
5. Kozyrev N.A. Causal or asymmetrical mechanics in linear approach. Publ. Leningr. Univ., Leningrad , 1991, pp. 232-287.
6. On the way to understanding the time phenomenon, Editor A.P. Levich, World Scientific. Part 1. 1995. 304 p., Part 2. 1996. 236 p.
7. Okun L.B. Physics of elementary particles. Nauka, Moscow, 1988, 272 p.
8. Lobachevski N.I. On the beginnings of geometry (1830). Compl. works, Gostechizdat, Mosc.-Leningr., 1946, Vol.1, pp.185-261.
9. Lobachevski N.I. Pangeometry (1855). Compl. works, Gostechizdat, Mosc.-Leningr., 1951, Vol.3, pp. 431-524.
10. Satellites of the Jupiter, Editor D. Morrison (transl. from English), Mir, Moscow, 1985, Pt.1., 264 p.
11. Satellites of planets, Editor J. Burns (transl. from English), Mir, Moscow, 1980, 632 p.